Integration and Run-time Specification (I&RTS) Status and Roadahead

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John Maurer

johnm@mitre.org

781-271-2985

Background and Objective

- **I&RTS Appendix B contains a checklist of Compliance Criteria which define a segment's level of run-time DII COE compliance**
- **RT TWG has twice reviewed Appendix B to identify recommended changes for RT DII COE**
  - **In both cases, many issues were raised**
  - **Had not reached closure (within TWG)**
- **Schedule implications**
  - **DISA schedule for developing I&RTS updates for COE 5.x has not been established**

    =No schedule pressure from DISA -- yet
  - **JTT/Raytheon, OrbExpress/OIS, TAO/OCI (and perhaps others?) are segmenting software for RT COE now**

    =Knowledge of changes needed NOW
- **Objective for the May Hostage Meeting**
  - **Review document to resolve all issues and finalize RT TWG recommended changes to DISA**

Way-ahead/Finishing (as reported at the last TWG Meeting)

- **Immediate**
  - **Distribute current "rough cut" TWG members**
- **Near-term**
  - **Complete clean-up work**
    - **=UI and Security sections**
    - **=Identify/enumerate dependencies and resources that will be required to be documented**
  - **Prepare Interim Guidance**
- **Medium-term**
  - **Resolve remaining configuration/KPC issue**
  - **Draft text for body of document**
    - **=Concise definition of Extended Toolkit**
    - **=Draft descriptions of IRTS issues for Real-time, Configurable and Integration Environment**
  - **Work with DISA to update I&RTS**

Interim Guidance History

- **After the hostage meeting, we recommended that DISA issue an Interim Guidance document for using the real-time extensions**
  - **“Fill the gap” until next I&RTS update**
  - **Document new concepts and usage for DII COE Real-time extensions**
  - **Provide formal guidance to programs targeted to real-time kernel**
- **DRAFT Interim Guidance includes two parts**
  - **Brief (four page) write up summarizing usage**
  - **Attachment containing the “marked up” I&RTS Appendix B**
- **Producing the document**
  - **Draft document prepared and updated by core team**
  - **Review/comment/update by DISA staff and Dr. Lawrence**
  - **Review/comment/update by RT TWG Subgroup**

Interim Guidance Status

- **Draft Interim Guidance for DII COE Real-time Extensions, Version 0.09**
  - **Incorporates all comments from DISA staff and Dr. Lawrence**
  - **Reviewed at RT TWG Kernel Subgroup**
- **Draft Interim Guidance for DII COE Real-time Extensions, Version 0.10**
  - **Incorporates minor changes resulting from R TWG Kernel Subgroup scrub**
  - **Data access, security, GUI still deferred to future time**
  - **General consensus--it's a good basis for moving on and ought to be formalized**
- **Marked Up Appendix B was discussed at the last TWG meeting--no plan to rehash it here**

Interim Guidance
General Considerations

- DISA is currently developing real-time extensions to the DII COE in order to support real-time command and control systems. The first release of DII COE with real-time extensions (DII COE RTE) will include a Real-time Toolkit (RTTK), which is a set of development and integration tools that runs initially on Solaris, and the Real-time Kernel Services (RTKS), a set of runtime services which run on the target platforms identified below. In addition, some infrastructure services and common support applications will operate in the DII COE RTE environment. Although the schedules are not linked, the DII COE RTKS and RTTK are planned for deployment in roughly the same timeframe as DII COE version 5.0. Once product stability has been demonstrated, DISA plans to merge the DII COE RTKS/RTTK and DII COE version 5.0 into a single code base.

Interim Guidance
Target Platforms

- The initial reference platforms for the RTKS include PowerPC-based VME single board computer (SBC) systems running LynxOS 3.1.0a and Sparc systems running Solaris 8. DISA will validate the RTKS on specific configurations of these initial target runtime platforms. Refer to the referenced "Installation Procedures and Software Version Description" document for the RTKS [reference 6] for additional detail.

Interim Guidance Scope

- This interim guidance applies to all software components targeted to the DII COE RTE in its beta and initial production releases. The DII COE RTE extends the DII COE capability in three dimensions: extended support for predictable real-time performance, configuration/tailoring of the DII COE kernel, and system composition principally from static object libraries assembled in an integration environment that will often involve cross-development for real-time platforms. Although all three of these dimensions extend orthodox DII COE concepts, they are all expected to be included in the mainstream DII COE starting with version 5.0.

- This guidance is effective immediately and supplements the following documents:
  - Integration and Runtime Specification (I&RTS), Version 4.0, October 1999

Interim Guidance Definitions

- **Segment**
- **Extended Toolkit**
  - An Extended Toolkit (ETK) comprises linkable or shared libraries, documentation and data that are variously used in a development environment, an integration environment, and/or a runtime environment. It may also include executable images destined for the target environment; these executables are not constrained to be installed in the COE runtime using the DII COE Installer tool. The key difference between an extended toolkit and a segment is that extended toolkits are not constrained to be loaded using the DII COE installer. (Note: ETKs supercede the current notion of a Software Development Kit (SDK) for real-time software. There has been no formal decision, but DISA reserves the right to replace SDKs with ETKs for version 5.0 of the I&RTS.)
- **Chief Engineer**

Interim Guidance
Guidance Items (1 of 6)

- .When used in conjunction with the DISA DII COE RTKS, the target platforms listed above will be DII COE RTE initial reference implementations.

- .Developers shall deliver software as either segments or "extended toolkits" (ETKs--see definition) or in both formats. Developers are encouraged to design software so that either (a) the software is delivered in both formats, or else (b) the software is delivered as an extended toolkit but can be easily and mechanically converted to a segment. (See figure 1.) Software delivered as an ETK shall successfully pass the checks performed by the "VerifySeg" tool. The referenced I&RTS, specifically including an interim version 5.0 update to Appendix B, applies to ETKs. (Initially, the COE installer will not be available on all COE RTE platforms. The option to deliver components as “segments” is viable only on platforms that support the COE Installer.)

Interim Guidance
Guidance Items (2 of 6)

- .For components intended for a real-time platform, any assumptions, requirements, or constraints regarding scheduling policy, priority level of schedulable entities (threads, processes, etc.), use of shared resources, periods and other scheduling parameters should be identified, documented, and approved by the cognizant chief engineer. As a minimum, the scheduling policy and initial priority settings in the as-delivered software must be identified, documented and approved. This information shall be documented in the IntgNotes file.
- .The SegName descriptor file is required for all segments and extended toolkits. For real-time segments and extended toolkits, the "real-time" attribute is also required in this descriptor.
- .The segment or extended toolkit shall access operating system services by using only POSIX-conformant APIs, rather than OS-specific APIs, to access all services that are standardized in the POSIX 1003.1:1996 specification and provided by the target operating system.

Interim Guidance
Guidance Items (3 of 6)

- .Requirements for shared memory to be reserved by the segment or extended toolkit shall be specified in the Hardware descriptor using keyword $OS_SHARED_MEMORY.
  - **Details regarding the use of the $OS_SHARED_MEMORY keyword are yet to be worked out.**
- .Dependencies on the PowerPC platform, such as specific board options, shall be documented in the Hardware descriptor using keyword $CPU using a value of either "PowerPC" or "PowerPC:RESTRICTED." If the value is "PowerPC:RESTRICTED, then the restrictions shall be documented in the IntgNotes file. ("RESTRICTED" is a new optional attribute for the $CPU keyword.)
- .Dependencies on specific hardware devices shall be documented in the Hardware descriptor using keyword $HW_DEVICE.
  - **Details regarding the use of the $HW_DEVICE keyword are yet to be worked out.**

Interim Guidance
Guidance Items (4 of 6)

- .Dependencies on the LynxOS operating system shall be documented in the Hardware descriptor using keyword $OPSYS using a value of either "LynxOS" or "LynxOS:RESTRICTED." If the value is "LynxOS:RESTRICTED," then the restrictions shall be documented in the IntgNotes file. ("RESTRICTED" is a new optional attribute for the $CPU keyword.) Requirements for documenting dependencies on other operating systems will be addressed on a case-by-case basis.

- For real-time segments or extended toolkits, dependencies on operating system services shall be documented in the Real-time descriptor using the keyword $POSIX_UNIT. Legal values for this keyword are identified in Appendix B of the Real-time Kernel Services SRS. (Legal values are based on POSIX Units of Functionality as described in POSIX 1003.13:1998.)

Interim Guidance
Guidance Items (5 of 6)

- .For real-time segments and extended toolkits, resource requirements of the software shall be documented in the IntgNotes file. These resource requirements include identification of any resources shared with other software or segments (including but not limited to critical sections), maximum holding times for all shared resources, and maximum blocking time attributable to the software. These resource requirements may include values of formulas governing CPU consumption, and the use of disk and network resources. Formulas should be provided to assist the integrator in tailoring gross resource requirements of the software to the specific mission environment. The methodology for determining these values shall be documented in the IntgNotes file.

- .For real-time segments and extended toolkits, dependencies of the software (or its performance) on specific development tools or environments (e.g. compiler dependencies) shall be documented in the IntgNotes file.

Interim Guidance
Guidance Items (6 of 6)

- **.For real-time segments and extended toolkits, the POSIX 1003.13 profiles on which the software will run shall be documented in the IntgNotes file.**

- **.For real-time segments and extended toolkits, the developer shall document any known restrictions on the target environment that are essential to the effective execution of this software in the IntgNotes file.**

- **.The Segment or extended toolkit shall fully specify direct dependencies upon kernel services. This is done through the REQUIRES segment descriptor exactly as would be done with dependencies on any other segment or extended toolkit.**

Interim Guidance
What Next??

- **Where it stands**
  - **All comments have been addressed**
  - **Kernel Subgroup has voted to forward this draft to DISA**

Kernel subgroup included three of the service reps to the RT TWG

- **Plan for Interim Guidance**
  - **Straw vote at RT TWG (now)**
  - **Anticipating positive outcome**
    - **=Send latest version (minor revisions) to Dr. Lawrence**
    - **=Send latest version to DISA Chief Engineer with recommendation that he issue this document as Interim Guidance**

Integration and Runtime Specification
What's Next???

- **Resolve remaining configuration/KPC issue**
- **Draft text for body of document**
- **Identify and resolve security, GUI and data access issues, if any**
- **Work with DISA to update I&RTS**